CLAIMS

What is claimed is:

1. A composition comprising:
at least one transition metal;
at least one high electron mobility component; and
a source of ionizing radiation.

2. The composition of claim 1, wherein the transition metal is iron, ruthenium, osmium, cobalt, rhodium, iridium, nickel, palladium or platinum.

3. The composition of claim 1, wherein the high electron mobility component is C, Si, Ge, Sn, AgBr, CdTe, HgSe, HgTe, AlAs, GaAs, GaSb, InP, InAs, InSb, SiC, $ZnSiP_2$, $CdSiP_2$, $CdSnAs_2$, $CdIn_2Te_4$, $Hg_5In_2Te_8$, PbSe, PbTe, Bi_2Te_3 or Te.

4. The composition of claim 1, wherein the source of ionizing radiation is thorium.

5. The composition of claim 1 further comprising aluminum.

6. The composition of claim 5, wherein the transition metal is iron, ruthenium, osmium, cobalt, rhodium, iridium, nickel, palladium or platinum.

7. The composition of claim 5, wherein the high electron mobility component is C, Si, Ge, Sn, AgBr, CdTe, HgSe, HgTe, AlAs, GaAs, GaSb, InP, InAs, InSb, SiC, $ZnSiP_2$, $CdSiP_2$, $CdSnAs_2$, $CdIn_2Te_4$, $Hg_5In_2Te_8$, PbSe, PbTe, Bi_2Te_3 or Te.

8. The composition of claim 5, wherein the source of ionizing radiation is thorium.

9. The composition of Claim 1 further comprising at least one group 1A alkali metal.

10. The composition of claim 9, wherein the group 1A alkali metal is lithium, sodium, or potassium.

11. The composition of claim 1 further comprising aluminum and at least one group 1A alkali metal.

12. The composition of claim 11, wherein the group 1A alkali metal and the aluminum are provided in a mole ratio in a range of about 10:1 to about 1:10 moles of alkali metal to moles of aluminum.

13. The composition of claim 11, wherein the transition metal is iron, ruthenium, osmium, cobalt, rhodium, iridium, nickel, palladium or platinum.

14. The composition of claim 11, wherein the group 1A alkali metal is lithium, sodium, or potassium.

15. The composition of claim 11, wherein the high electron mobility component is C, Si, Ge, Sn, AgBr, CdTe, HgSe, HgTe, AlAs, GaAs, GaSb, InP, InAs, InSb, SiC, $ZnSiP_2$, $CdSiP_2$, $CdSnAs_2$, $CdIn_2Te_4$, $Hg_5In_2Te_8$, PbSe, PbTe, Bi_2Te_3 or Te.

16. The composition of claim 11, wherein the source of ionizing radiation is thorium.

17. The composition of claim 11, wherein the transition metal is nickel, the Group 1A alkali metal is lithium, sodium or potassium, the high electron mobility component is germanium, and the source of ionizing radiation is thorium.

18. A method of producing hydrogen gas comprising the steps of:
providing the composition of claim 1; and
contacting the composition with water.

19. A method of producing hydrogen gas comprising the steps of:
providing the composition of claim 5; and
contacting the composition with water.

20. A method of producing hydrogen gas comprising the steps of:
providing the composition of claim 9; and
contacting the composition with water.

21. A method of producing hydrogen gas comprising the steps of:
providing the composition of claim 5; and
contacting the composition with aqueous hydroxide ion.

22. A method of producing hydrogen gas comprising the steps of:
providing the composition of claim 11; and
contacting the composition with water.

23. A method of manufacturing the composition of claim 1, comprising the steps of:
providing the at least one transition metal, the at least one high electron mobility component, and the source of ionizing radiation as ingredients;
melting the ingredients to form a mixture; and
cooling the mixture until the mixture solidifies.

24. A method of claim 23 further comprising exposing the mixture to the source of ionizing radiation.

25. A method of manufacturing the composition of claim 5, comprising the steps of:

providing the at least one transition metal, the aluminum, the at least one high electron mobility component, and the source of ionizing radiation as ingredients;

melting the ingredients to form a mixture; and

cooling the mixture until the mixture solidifies.

26. A method of manufacturing the composition of claim 9, comprising the steps of:

providing the at least one transition metal, the at least one group 1A alkali metal, the at least one high electron mobility component, and the source of ionizing radiation as ingredients;

melting the ingredients to form a mixture; and

cooling the mixture until the mixture solidifies.

27. The method of claim 25, further comprising exposing the mixture to the source of ionizing radiation.

28. The method of claim 26, further comprising exposing the mixture to the source of ionizing radiation.

29. A method of manufacturing the composition of claim 11, comprising the steps of:

providing the at least one transition metal, the aluminum, the at least one group 1A alkali metal, the at least one high electron mobility component; and the source of ionizing radiation as ingredients;

melting the ingredients to form a mixture; and

cooling the mixture until the mixture solidifies.

30. The method of claim 29, further comprising exposing the mixture to the source of ionizing radiation.

31. A battery comprising an anode, a cathode, and an electrolyte, wherein the anode comprises the composition of claim 1.

32. A battery comprising an anode, a cathode, and an electrolyte, wherein the anode comprises the composition of claim 5.

33. A battery comprising an anode, a cathode, and an electrolyte, wherein the anode comprises the composition of claim 9.

34. A battery comprising an anode, a cathode, and an electrolyte, wherein the anode comprises the composition of claim 11.

35. A capacitor comprising an anode in contact with a sample of carbon foam, a cathode, an electrolyte, and a dielectric, wherein the anode comprises the composition of claim 1.

36. A capacitor comprising an anode in contact with a sample of carbon foam, a cathode, an electrolyte, and a dielectric, wherein the anode comprises the composition of claim 5.

37. A capacitor comprising an anode in contact with a sample of carbon foam, a cathode, an electrolyte, and a dielectric, wherein the anode comprises the composition of claim 9.

38. A capacitor comprising an anode in contact with a sample of carbon foam, a cathode, an electrolyte, and a dielectric, wherein the anode comprises the composition of claim 11.

39. A fuel cell comprising an anode, a cathode, and an electrolyte, wherein the anode comprises the composition of claim 1.

40. A fuel cell comprising an anode, a cathode, and an electrolyte, wherein the anode comprises the composition of claim 5.

41. A fuel cell comprising an anode, a cathode, and an electrolyte, wherein the anode comprises the composition of claim 9.

42. A fuel cell comprising an anode, a cathode, and an electrolyte, wherein the anode comprises the composition of claim 11.

43. A fuel cell assembly comprising a conventional hydrogen fuel cell and a hydrogen generator, wherein the hydrogen generator comprises the composition of claim 1 and water.

44. A fuel cell assembly comprising a conventional hydrogen fuel cell and a hydrogen generator, wherein the hydrogen generator comprises the composition of claim 5 and water.

45. A fuel cell assembly comprising a conventional hydrogen fuel cell and a hydrogen generator, wherein the hydrogen generator comprises the composition of claim 9 and water.

46. A fuel cell assembly comprising a conventional hydrogen fuel cell and a hydrogen generator, wherein the hydrogen generator comprises the composition of claim 5 and aqueous hydroxide ion.

47. A fuel cell assembly comprising a conventional hydrogen fuel cell and a hydrogen generator, wherein the hydrogen generator comprises the composition of claim 11 and water.